

Instructions: The exam. consists of 12 problems. There is space to work beside each problem. Most of the problems offer multiple-choice answers. You should use the answers to check yourself. It is important to show your work, and make your steps clear and readable. Partial credit may be given for solutions that are set up correctly, even though the final answer is incorrect, and full credit may not be given for a correct answer that is not supported by correct work.

Please remember your obligations under the honor code.

The spaces below are not for answers—but for recording scores.

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1. Sketch the graph of $f(x) = 3^{-x}$. Your graph should make clear whether the function is increasing or decreasing, the value at $x = 0$, and what happens as $x \rightarrow \infty$ and as $x \rightarrow -\infty$. 3.5in

2. If $\ln \ln x = 1$, what is x ?

(a) e .3in (b) e^e .3in (c) 1 .3in (d) $1e$.3in (e) $1e^e$

3. What is $\frac{d}{dx} x^x$?

(a) $x^x(1 + \ln x)$.3in (b) x^{x-1} .3in (c) x^x .3in (d) $1 + \ln x$.3in (e) $1x^x$

2.8in

4. If $y = (x + 1)^2 x^3 x + 3$, what is y' ?

(a) $(x + 1)^2 x^3 x + 3 (6 + 2x - 3x^2)$.3in (b) $(x + 1)^2 x^3 x + 3 (2x + 1 + 3x - 1x + 3)$

(c) $6(x + 1) x^2$.3in (d) $2 \ln(x + 1) + 3 \ln x - \ln(x + 3)$

(e) this derivative is too gruesome to think about

5. If $f'(x) = 3f(x)$, and $f(0) = 2$, then what is $f(2)$?

(a) $12e$.3in (b) $4e^3$.3in (c) $3e^4$.3in (d) $6e^2$.3in (e) $2e^6$

2.8in

6. If \$1000 is invested at 8% interest, compounded quarterly (i.e., four times per year), what is the value of the investment after one year?

- (a) $1080 e^4$.8in (b) $1000 e^{-.32}$.8in (c) $1000 e^{.08}$
(d) $1000(1.02)^4$.8in (e) $1000(1.08)$

7. What is $\lim_{n \rightarrow \infty} (1 + .08n)^n$?

- (a) 0.3in (b) $(.08)^e$.3in (c) $e^{.08}$.3in (d) $1.08e$.3in (e) ∞
2.8in

8. The population of geese at ND was 50 in June of 1995, and 200 in June of 1999. Using an exponential model, predict the population of geese for June of 2000.

- (a) $200 e$.3in (b) $50e^5$.3in (c) $200\sqrt{2}$.3in (d) 250 .3in (e) $250\sqrt{2}$

9. Find $\lim_{x \rightarrow 1} \ln xx^2 - 1$.

- (a) 14.3in (b) 12.3in (c) 34.3in (d) 1.3in (e) ∞
2.8in

10. What is $\int_0^1 xe^{2x} dx$?

- (a) $12(e - 1)$.5in (b) $14(e^2 - 2)$.5in (c) $12(e^2 + e)$
(d) $12(e^2 - e)$.5in (e) $14(e^2 + 1)$

11. What is $\int 2(x - 1)(x + 2)dx$?

- (a) $12 \tan^{-1} x + c$.2in (b) $3 \ln |x + 2| - 2 \ln |x - 1| + c$
(c) $23(\ln |x - 1| - \ln |x + 2|) + c$.2in (d) $12 \ln |x - 1| + 13 \tan^{-1} x + c$
(e) the integral is indeterminate

3in

12. What is $\int \cos^3 x dx$?

- (a) $\sin x - 13 \sin^3 x + c$.3in (b) $14 \cos^4(x) + c$.3in (c) $\sin^3(x) + c$
(d) $-3 \cos^2 x \sin x + c$.3in (e) $\ln(\cos x - \sin x) + c$